

AD-A250 717



(2)

IDA PAPER P-2568

## THE EXPERIENCE MIX OF ENLISTED PERSONNEL IN THE MILITARY

Stanley A. Horowitz, *Project Leader*

November 1991

DTIC  
SELECTED  
MAY 22 1992

*Prepared for*  
Office of the Assistant Secretary of Defense  
(Force Management and Personnel)

Approved for public release; distribution unlimited.



INSTITUTE FOR DEFENSE ANALYSES  
1801 N. Beauregard Street, Alexandria, Virginia 22311-1772

92-13044



92 5 15 015

IDA Log No. HQ 91-37088

## **DEFINITIONS**

IDA publishes the following documents to report the results of its work.

### **Reports**

Reports are the most authoritative and most carefully considered products IDA publishes. They normally embody results of major projects which (a) have a direct bearing on decisions affecting major programs, (b) address issues of significant concern to the Executive Branch, the Congress and/or the public, or (c) address issues that have significant economic implications. IDA Reports are reviewed by outside panels of experts to ensure their high quality and relevance to the problems studied, and they are released by the President of IDA.

### **Group Reports**

Group Reports record the findings and results of IDA established working groups and panels composed of senior individuals addressing major issues which otherwise would be the subject of an IDA Report. IDA Group Reports are reviewed by the senior individuals responsible for the project and others as selected by IDA to ensure their high quality and relevance to the problems studied, and are released by the President of IDA.

### **Papers**

Papers, also authoritative and carefully considered products of IDA, address studies that are narrower in scope than those covered in Reports. IDA Papers are reviewed to ensure that they meet the high standards expected of refereed papers in professional journals or formal Agency reports.

### **Documents**

IDA Documents are used for the convenience of the sponsors or the analysts (a) to record substantive work done in quick reaction studies, (b) to record the proceedings of conferences and meetings, (c) to make available preliminary and tentative results of analyses, (d) to record data developed in the course of an investigation, or (e) to forward information that is essentially unanalyzed and unevaluated. The review of IDA Documents is suited to their content and intended use.

The work reported in this document was conducted under contract MDA 903 89 C 0003 for the Department of Defense. The publication of this IDA document does not indicate endorsement by the Department of Defense, nor should the contents be construed as reflecting the official position of that Agency.

This Paper has been reviewed by IDA to assure that it meets high standards of thoroughness, objectivity, and appropriate analytical methodology and that the results, conclusions and recommendations are properly supported by the material presented.

## UNCLASSIFIED

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188
<p>Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.</p>			
1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED	
	November 1991	Final Report, Jun 1990 – Nov 1991	
4. TITLE AND SUBTITLE		5. FUNDING NUMBERS	
The Experience Mix of Enlisted Personnel in the Military		C-MDA-903-89C-0003 T-L7-798	
6. AUTHOR(S)			
Stanley A. Horowitz			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)		8. PERFORMING ORGANIZATION REPORT NUMBER	
Institute for Defense Analyses 1801 N. Beauregard Street Alexandria, VA 22311-1772		IDA-P-2568	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
OASD(FM&P) Room 3E763, The Pentagon Washington, D.C. 20301			
11. SUPPLEMENTARY NOTES			
12A. DISTRIBUTION/AVAILABILITY STATEMENT		12B. DISTRIBUTION CODE	
Approved for public release; distribution unlimited			
13. ABSTRACT (Maximum 200 words)			
<p>This paper is one in a series of studies concerned with identifying approaches to maintaining a strong military manpower capability during a period of declining budgets and force levels. Its focus is on the proper experience mix of enlisted personnel. The experience level of enlisted personnel has been growing, raising personnel costs. Some argue that experience should be cut back. In many occupations, however, personnel performance improves substantially with experience. This paper addresses determining the mix of experience that appropriately balances performance and cost. Finding this balance could maintain a high level of force readiness and save money. The paper describes current policies concerning personnel experience, and how we came to have them. The limited evidence regarding the relationship between experience and performance is reviewed. The extent to which greater experience increases compensation costs and decreases training costs is examined. It appears that greater experience would be a good buy in at least some occupations, but existing information is too sparse to support wholesale policy changes. The paper recommends experiments that reduce manning levels while beefing up experience in selected areas, such as maintenance. It also recommends developing better evidence on the relationship between experience and performance for a wide range of occupations. Two specific policy changes are suggested as candidates for rapid implementation.</p>			
14. SUBJECT TERMS		15. NUMBER OF PAGES	
Military Personnel, Manpower, Experience, Costs		28	
		16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	SAR

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)  
 Prescribed by ANSI Std. Z39-18  
 298-102

UNCLASSIFIED

IDA PAPER P-2568

## THE EXPERIENCE MIX OF ENLISTED PERSONNEL IN THE MILITARY

Stanley A. Horowitz, *Project Leader*

November 1991

Approved for public release; distribution unlimited.



INSTITUTE FOR DEFENSE ANALYSES

Contract MDA 903 89 C 0003  
Task T-L7-798

## PREFACE

This paper was prepared by the Institute for Defense Analyses (IDA) for the Office of the Assistant Secretary of Defense (Force Management and Personnel) (OASD (FM&P)), under contract MDA 903 89 C 0003, Task Order T-L7-798, issued 15 March 1990. The objective of the task was to identify promising approaches to maintaining strong military manpower capability during a period of declining budgets and force levels. This is one of a total of seven papers to be published. Each of the seven papers covers a specific area of military manpower management: the proper experience mix, personnel movement, the timing of training, lateral entry, the link between career progression and assumption of management responsibilities, individual training methods, and increased use of simulators for training. The topic of this paper is the proper experience mix of personnel.

The author wishes to thank Christopher Jahn for initiating this investigation. Carl Dahlmann, Jeanne Fites, Robert F. Lockman, John Enns, Russell Beland, John T. Warner, Bruce Angier, Matthew Goldberg, Karen Tyson, and Kathryn Wilson made valuable comments on early drafts of the paper. Stephen Welman lined up much of the data presented, with the assistance of Michael Dove of the Defense Manpower Data Center. Linda Garlet made critical contributions to editing and producing the paper. This work was reviewed by Waynard C. Devers and William T. Mayfield of IDA and by Harry J. Gilman, an IDA consultant.



Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unpublished	<input type="checkbox"/>
Justification	
By _____	
Distribution/ _____	
Availability Codes	
Dist	Avail and/or Special
A-1	

## CONTENTS

Preface .....	iii
I. Introduction .....	1
A. Background and Objective.....	1
B. Organization of This Paper .....	2
II. The Evolution of the Experience Mix .....	5
III. The Formation of Experience Policy .....	9
IV. Evidence Concerning the Proper Experience Mix .....	11
A. Costs.....	11
B. Experience, Performance, and Readiness .....	12
C. The Proper Experience Mix .....	15
D. Additional Considerations .....	16
1. Other Costs and Benefits .....	16
2. Implementation Issues .....	17
V. Summary and Recommendations.....	19
A. Summary.....	19
B. Recommendations.....	19
1. Research on Experience and Performance.....	20
2. Integrating the Costs and Benefits of Experience.....	20
3. Experimental Confirmation .....	20
4. Actions to Modify the Experience Mix .....	21
References .....	23
Abbreviations .....	Abb-1

## **TABLES**

1. Percentage of Enlisted Personnel in Paygrades E1-E4, FY 1989 .....	5
2. Length of Service of Active-Duty Enlisted Personnel, 1975-1990.....	6
3. Paygrades of Active-Duty Enlisted Personnel, 1975-1990.....	7
4. Paygrades of Active-Duty Enlisted Personnel by Occupation, FY 1989.....	8
5. Comparison of Oilers Manned by Navy and Civilian Crews.....	13

## I. INTRODUCTION

### A. BACKGROUND AND OBJECTIVE

The military services of the United States have traditionally been staffed in large part by relatively young and inexperienced personnel. In 1990, about half of our enlisted personnel had less than five years of service. Their median age was 23. The average length of service was 6.8 years. This is quite similar to average job experience in the civilian economy. Average civilian tenure has been measured at about 6.5 years [1]. Civilian employers, however, do not typically make the large initial investments in the formal training of personnel that the military makes. Because of these up-front training expenditures, one might expect the military to want to keep its employees significantly longer than civilian firms do. At least two factors may help explain why they do not. War is considered a young man's endeavor. Strength, speed, and perhaps recklessness are important components of many military jobs. In addition, the availability of draftees before 1972 led to the development of a system designed to use a continuing flow of junior personnel.

To some extent, of course, the preponderance of inexperienced personnel flows from the pyramidal nature of the military personnel system. The system develops its own senior people from scratch; there is very little lateral entry into the career force. Thus, if accessions are constant, as the number of years of service rises, the fraction of the force with that amount of service must fall. Despite this law of nature, the mix of experience is heavily influenced by retention behavior. Retention in turn is quite sensitive to factors that are controlled by the Department of Defense (DoD), including pay and bonuses.

Senior personnel are often much more productive than junior personnel. They are also more expensive. It is not evident that the experience mix in the DoD achieves the right balance between cost and effectiveness.

In recent years the experience mix has been shifting largely without regard to long-term cost-effectiveness considerations [2]. High retention levels have driven up the proportion of more experienced personnel. This trend may be reinforced by the way in which the reduced manning levels of the post-Cold War period are attained. We are

responding to the need to decrease personnel strength by disproportionately cutting recruiting.

In this era of tight defense budgets it is important to spend no more on manpower than is necessary. It may be possible to maintain military readiness and capability more cheaply by altering the experience mix of service personnel. Finding the point of balance between the extra productivity of more experienced personnel and their higher cost is not a simple matter. Indeed, appropriately measuring costs and (especially) productivity are difficult jobs. Personnel are more productive if they make a greater contribution to unit effectiveness, and ultimately to national military capability. These are not things the services measure every day, but explicit consideration of contributions to effectiveness can and should play a more explicit role in shaping manpower policy in general and experience policy in particular.

Some researchers have argued that the enlisted force should be more experienced, trading off more quality for less quantity [3]. Others have argued for arresting the trend toward greater experience [2]. The issue is complicated by the fact that the proper mix of experience is not the same in all occupations. The purpose of this paper is to examine the direction in which policy regarding the experience mix of enlisted personnel should move.

## B . ORGANIZATION OF THIS PAPER

The remainder of the paper is organized around the following outline:

- The results of current policy will be described. The distribution of experience will be presented. The way that the distribution has changed over time and the way that it varies among occupations will be discussed.
- The mechanisms behind current policy will be examined. The desired paygrade mix is loosely derived from the requirements determination process, the process that develops manning documents for units. Both the planned and actual mixes of experience differ from the one implied by summing up requirements at the unit level largely because of fluctuations in supply conditions in the market for military manpower.
- Evidence regarding the appropriate mix of experience will be reviewed. On the cost side this review includes consideration of how much a richer experience mix can save in training costs as well as how much it can cost for additional pay and benefits. On the effectiveness side it will focus on the literature that analyzes military performance as a function of the experience of personnel.
- The direction in which policy should move will be assessed. The picture is mixed. It appears that greater experience would be a good buy in at least some

occupational areas. However, in other occupations information about the value of additional experience is quite limited.

- Recommendations for implementing change will be presented. They involve suggestions for pilot programs involving richer experience mixes, for additional statistical research, and for legislative initiatives that would be needed to permit attainment of a more experienced enlisted force in selected occupations.

## II. THE EVOLUTION OF THE EXPERIENCE MIX

Table 1 shows that more than half of all enlisted personnel are in the bottom four paygrades. Paygrade E4 is typically reached during the first four years of active-duty service. In technical occupations, E4 may be considered the lowest journeyman level.

**Table 1. Percentage of Enlisted Personnel in Paygrades E1-E4, FY 1989**

	Army	Navy	Air Force	Marine Corps	All DoD
Active	57.5	54.1	52.0	69.2	56.2
Reserve	58.0	48.5	20.6	77.4	50.7 <sup>a</sup>
Guard	53.6		31.0		

Source: Defense Manpower Data Center.

<sup>a</sup> Includes both Guard and Reserve.

One would expect the Air Force and the Navy, with their emphasis on sophisticated equipment, to have a more experienced force than the Army and Marine Corps, hence a lower percentage of E1-E4 personnel. It is interesting, however, how moderate the paygrade differences are among the active Army, Navy, and Air Force.

In the Navy and Air Force, reserve component personnel are more senior than are their active counterparts. This reflects the entry of many active-duty veterans into the reserves, particularly in the Air Force. Navy reserve data would look more like Air Force data except for the perceived need to provide junior people to round out ships' companies in case of mobilization.

Table 1 shows paygrade statistics. In a sense, these reflect the distribution of responsibilities rather than the distribution of experience. Table 2 focuses on the distribution of length of service (LOS) in the active force and on how it has shifted during the post-Vietnam War era.

There has been a dramatic movement toward increased experience since the end of the draft. In 1975, over 60 percent of enlisted personnel had less than five years of service. By 1990, this had fallen to under 45 percent. During the late 1970s, most of the shift reflected the substitution of junior careerists for first termers. In the 1980s, this

continuing trend was joined by an increase in the proportion of senior careerists. Last year (1990) saw the largest one-year increase in experience levels. This increase is presumably due to the cuts in recruiting that have been associated with reductions in total personnel levels.

**Table 2. Length of Service of Active-Duty  
Enlisted Personnel, 1975-1990**

Years of Service by Service	1975	1980	1985	1989	1990
Army					
0-4	66.35	60.32	54.55	50.22	47.41
5-10	17.19	23.98	25.88	26.31	27.21
11-20	13.84	13.12	17.38	21.21	23.09
21+	2.61	2.57	2.19	2.26	2.28
Navy					
0-4	59.34	57.88	50.15	49.87	48.04
5-10	18.43	22.99	29.62	27.22	27.49
11-20	19.79	16.42	16.87	20.25	21.81
21+	2.43	2.71	3.34	2.66	2.66
Air Force					
0-4	48.13	48.07	42.13	35.78	31.51
5-10	21.82	23.73	29.70	31.28	32.12
11-20	22.55	23.21	23.64	27.60	31.07
21+	7.49	4.99	4.53	5.34	5.31
Marine Corps					
0-4	75.45	72.06	62.89	59.33	58.59
5-10	14.27	17.97	23.67	23.43	23.54
11-20	8.48	8.15	11.79	15.36	15.86
21+	1.79	1.82	1.65	1.89	2.01
All DoD					
0-4	60.43	57.64	50.85	47.32	44.78
5-10	18.50	23.08	27.71	27.56	28.14
11-20	17.24	16.12	18.37	22.00	23.97
21+	3.83	3.16	3.07	3.12	3.12

Source: Defense Manpower Data Center.

Experience levels have increased in all the services, but not to the same extent. The Army and Marine Corps had the most experience growth, while the Navy had the least. Measured by years of service, the Army is now, for the first time, more experienced than the Navy.

When the draft ended, the pay of junior personnel was increased considerably. One might suspect that the growth in experience is the result of DoD's responding to the change in the relative cost of junior and senior people. This does not appear to be the case.

Personnel requirements regarding experience are stated more in terms of paygrade than length of service. Table 3 shows that the paygrade distribution has shifted far less in the last fifteen years than the LOS distribution has.

**Table 3. Paygrades of Active-Duty  
Enlisted Personnel, 1975-1990**

Paygrade by Service	1975	1980	1985	1989	1990
<b>Army</b>					
E1-E4	64.25	62.02	58.61	57.49	55.68
E5-E6	26.61	28.74	30.59	31.87	33.04
E7-E9	9.14	9.23	10.80	10.64	11.28
<b>Navy</b>					
E1-E4	59.45	59.15	54.18	54.13	52.98
E5-E6	31.21	31.96	36.39	36.32	37.05
E7-E9	9.34	8.89	9.43	9.56	9.97
<b>Air Force</b>					
E1-E4	56.82	56.60	54.84	52.02	48.92
E5-E6	33.15	33.10	34.47	36.52	38.91
E7-E9	10.03	10.30	10.69	11.47	12.17
<b>Marine Corps</b>					
E1-E4	71.21	72.02	69.28	68.19	68.17
E5-E6	21.32	20.69	22.71	23.48	23.53
E7-E9	7.48	7.29	8.01	8.33	8.31
<b>All DoD</b>					
E1-E4	61.65	60.84	57.44	56.18	54.49
E5-E6	29.07	29.93	32.43	33.50	34.69
E7-E9	9.28	9.23	10.13	10.32	10.82

Source: Defense Manpower Data Center.

Between 1975 and 1990, the fraction of personnel in the first five years of service fell by 16 percentage points. The fraction of personnel in the four lowest paygrades only fell by 7 percentage points.

The paygrade shift was not the result of redefinition of the paygrade requirements of pre-existing jobs. To some extent, it was the result of the increasingly automated and technical nature of the military.<sup>1</sup> The paygrade distribution shifted mostly because of the All Volunteer Force's high retention rates. The shift was principally one of supply, not demand.

<sup>1</sup> Captain William J. Keating, Director of Military Requirements in OASD(FM&P), advances this interpretation. Colonel John Cartland, the Army's Deputy Director of Manpower, notes that the Army eliminated some junior billets when it developed light divisions.

Since more senior personnel can be expected to be more productive, one might expect the growth in experience to be accompanied by a reduction in the number of personnel. If you have better people, you should be able to do the job with fewer. This reduction did not occur to any appreciable extent. In 1975, there were 1.82 million enlisted personnel. In 1989, there were 1.81 million.

Table 4 shows that the paygrade distribution differs among occupations.

**Table 4. Paygrades of Active-Duty Enlisted Personnel by Occupation, FY 1989**

Occupation	Percentage E1-E4
Functional support and administration	45.6
Other technical and allied specifications	45.8
Electronic equipment repairers	47.4
Craftsmen	49.7
Communications and intelligence	52.1
Electrical/mechanical equipment repairers	52.4
Medical and dental	57.8
Infantry/gun crews/sea specialists	58.6
Service and supply handlers	58.6

Source: Defense Manpower Data Center.

Note: The numbers in this table do not include non-occupational personnel, those so junior that they have not yet been assigned an occupation.

There is, perhaps, less of a relationship between the amount of technical expertise demanded by an occupation and the seniority of its personnel than one might expect. The low seniority level of medical and dental specialists seems surprising. It may reflect the heavy reliance of these occupations on the reserves. Maybe most surprising is the observation that in even the most technical occupational groups, almost half of all enlisted personnel can at best be considered junior journeymen. In addition, seniority growth has been relatively more prominent in occupations requiring low skill and short training time [2].

### **III. THE FORMATION OF EXPERIENCE POLICY**

The experience mix of the enlisted force is conceptually based on the desired experience levels in the individual units that make up the force. The desired mixes of skill levels in units draws on two kinds of inputs: industrial engineering analysis and reliance on accepted practice.

When a new kind of unit is being set up (a new kind of ship, for example), industrial engineers examine the tasks that must be performed and decide what mix of skills can most efficiently perform them. The tasks considered must include ancillary duties, like fire fighting, as well as technical ones, like fixing radars. This methodology appears to be capable of properly balancing the superior performance of more experienced personnel against their higher cost, but there may be a tendency toward traditional manning patterns rather than explicit analysis of alternative manning possibilities.

The services' relatively junior paygrade structure dates in large part from the era of the draft, when inexperienced personnel appeared to be much cheaper than they are today. The billet structures of units are not typically altered unless there are changes in equipment, though broad reorganizations can lead to modifications in the mix of billets. When more technically advanced equipment is introduced, manpower requirements may be modified to include more high paygrade billets.

As a practical matter, the experience mix implied by desired experience levels in individual units plays a relatively small role in determining year-to-year fluctuations in the actual experience mix. In DoD Directive 1304.20 and DoD Instruction 1300.14, the Office of the Secretary of Defense (OSD) requires the services to develop a management target for the experience mix called the Program Objective Force (POF). It is defined as an achievable enlisted personnel force identified by grade and years of service, which supports the accomplishment of the military service missions. While it is meant to be based on requirements at the billet level, the POF is driven by the current mix of experience and expectations about departures, promotions, and accessions. These, in turn, are influenced by expectations concerning budget and compensation levels.

For example, assuming continued reluctance to rely on lateral entry of highly skilled personnel, the only way to increase the level of experience in the enlisted force is to

improve retention. The most obvious way to improve retention is to raise compensation. Awarding higher reenlistment bonuses in occupations where greater experience is desired is probably the most cost-effective way of raising compensation. At times, Congress has been reluctant to support greater use of targeted bonuses. It would not make sense to generate a POF with proportions of senior personnel that could not be attained by today's compensation system. The retirement system, which makes it attractive to stay in the military for twenty years, but not longer, also strongly shapes the experience mix.

There are also more formal constraints on the allowable experience mix. The services are legislatively prohibited from allowing more than 1 percent of their enlisted personnel to be in paygrade E9 and from allowing more than 3 percent to be in the top two paygrades combined. OSD further stipulates that the percentage of personnel in paygrades above E3 and above E4 (called "top six" and "top five" ratios) cannot exceed the target levels in the approved POF. In addition, the number of personnel in paygrades above E4 cannot exceed the number with more than four years of experience.

DoD Instruction 1300.14 requires the services to evaluate the match between the POF and requirements derived from force structure considerations. According to the General Accounting Office (GAO), the services do not do this because they lack the capability to perform the necessary cost-effectiveness analyses [4]. OSD has directed the services to develop a framework for explaining increases in enlisted experience profiles on the basis of cost and combat effectiveness, and to justify the changes in grade plans based on the manpower requirements of the programmed force structure.<sup>2</sup> GAO notes that OSD has been attempting to constrain the growth of experience, but has not established criteria to determine the level of seniority needed.

Broadly speaking, the experience mix has come to be what it is today because recent compensation levels, coupled with the relatively high propensity for continued service on the part of voluntary military personnel, have supported high retention rates. There has been very little examination of whether the shift to a more senior force has been cost-effective, how far it should be taken, or whether it should be reversed.

---

<sup>2</sup> These points were made in two 1989 memoranda, one from the Deputy Secretary of Defense and one from the Office of the Assistant Secretary for Force Management and Personnel. It was stated that revisions of DoD Directive 1304.20 and DoD Instruction 1300.14 incorporating this guidance will be issued. Drafts of the new directive and instruction have not yet been prepared.

## IV. EVIDENCE CONCERNING THE PROPER EXPERIENCE MIX

### A. COSTS

At the individual level, there are four principal cost differences between junior and senior personnel. They involve pay and allowances, retirement benefits, training and recruiting, and on-the-job training (OJT) costs. Pay and allowances for senior personnel are higher than for junior personnel. An E8 makes almost twice what an E4 does.<sup>3</sup>

Current treatment of retirement pay accrual does not adequately capture the extent to which senior personnel are more expensive than junior personnel. This is because senior personnel have a far higher probability of reaching retirement. Current accounting practice allocates the same fraction of base pay to cover retirement expenses for all personnel regardless of seniority. The RAND Corporation estimates that capping the proportion of personnel with ten or more years of service at its 1988 level could save \$2 billion per year (compared with the cost of the length of service distribution that would result from a continuation of recent retention patterns) [2].

On the other hand, training and recruiting costs are much lower for senior personnel. Formal training is largely provided early in a person's careers. In some occupations, it is very lengthy and expensive. Some electronics technicians go to school for over 240 days before going to a productive assignment. The cost of this kind of training can be over \$27,000 [5].<sup>4</sup> The recruit training costs that precede occupational training run around \$4,000 [6]. Formal training is not only a financial expense, it uses over 115 thousand military personnel who count against endstrength constraints.<sup>5</sup>

Junior personnel incur OJT costs in addition to formal training costs. Research indicates that an average Navy school graduate requires six months before being qualified

---

<sup>3</sup> A married E8 with eighteen years of service gets monthly pay plus allowance for quarters of \$2,644; a single E4 with four years of service gets \$1,352.

<sup>4</sup> The cost used here is in FY 1992 dollars. It is the cost for a high-quality (mental group 1-3A) high school graduate. Training costs for lower quality personnel tend to be higher because of higher attrition rates.

<sup>5</sup> See the Executive Summary of *Military Manpower and Training Report 1991*, October 1990 revision.

to be an E4. During this time, enlisted supervisors spend a lot of their time providing OJT. The average cost of this time has been estimated to be roughly \$14,000 [7].<sup>6</sup>

One estimate is that attracting additional high-quality recruits would cost over \$11,000 [8].<sup>7</sup> When all the up-front costs are added together, junior personnel can cost over \$60,000 to recruit and train. This is an offset against the higher salaries and expected retirement pay attributable to senior personnel.

Senior personnel offer another potential source of savings: if they are more productive, fewer of them are needed to get the job done. In the experience creep of the last fifteen years, DoD has found itself with a more experienced force, but it has not made an effort to take advantage of this by reducing endstrength.<sup>8</sup> Of course, the amount personnel levels can be reduced depends on how much more productive senior personnel are than junior personnel.

## B . EXPERIENCE, PERFORMANCE, AND READINESS

Observation suggests that some units can be far more efficient with fewer highly qualified personnel. The Military Sealift Command (MSC) staffs auxiliary ships with highly experienced civilian crews. Table 5 shows that MSC oilers are physically very similar to Navy oilers, though they have different kinds of propulsion plants. But their crews are very different. The MSC ships have only 45 percent as many people as do Navy oilers. The MSC numbers include a 21-member Navy communications detachment. There could hardly be more difference in the experience levels of the two crews. The median level of experience on a Navy oiler is five years, on an MSC oiler it is nearly 25 years. MSC has clearly traded a large number of personnel to buy a smaller number of more experienced personnel. The result of this trade is a 30-percent reduction in fully-loaded manpower costs.

---

<sup>6</sup> This cost estimate (in FY 1992 dollars) excludes "student" pay costs during the OJT period.

<sup>7</sup> The costs would be less for lower quality personnel, who do not have as attractive civilian job alternatives. "High quality" is defined as mental group 1-3A (the top half of the mental group distribution) high school graduates.

<sup>8</sup> Given the low readiness levels of the late 1970s, it may well have been correct not to reduce personnel levels in response to increasing experience. The goal was to increase readiness, and it has increased. In the future, however, it should be possible to substitute quality for quantity while maintaining readiness.

**Table 5. Comparison of Oilers Manned by Navy and Civilian Crews**

	Navy Crew	Civilian Crew
Class	AO 177	T-AO 187
Length	709 feet	678 feet
Propulsion	steam	diesel
Payload	180,000 tons	180,000 tons
Speed	20 knots	20 knots
Date introduced	1981	1986
Number of personnel	263	119
Average experience	5 years	24 years
Annual personnel cost	\$8.3 million	\$5.9 million

In peacetime, the MSC ships deploy many more days per year than Navy ships do. They appear to be an outstanding buy. One wonders if the opportunity for similar results exists elsewhere in the services.

A substantial body of literature indicates that in some circumstances units with higher ratios of senior to junior personnel are likely to be better units. An analysis of trends in the readiness of ships in the late 1970s and early 1980s showed a significant relationship between the fraction of ships with no serious mission degrading equipment failures and the presence of senior personnel. This result is consistent with what was widely believed about the causes of the "hollow military" of that period.<sup>9</sup> An early study of the determinants of the condition of shipboard equipment operated and maintained by personnel in each of six Navy occupations found experience to be the most consistent predictor of readiness [9].<sup>10</sup>

A 1982 study of aviation readiness indicated that a substantial and significant relationship exists between the seniority of maintenance personnel and two measures of squadron performance—mission capable rate and sorties flown. This relationship was found for all three categories of occupations examined (highly technical, technical, and semi-technical) [10]. A more recent examination of ships found a very strong relationship between total crew pay and ship readiness. Since experience is the principal determinant of pay, this finding bears directly on the value of experience for performing militarily relevant tasks [11].

---

<sup>9</sup> This work was done by Alan J. Marcus. It is cited in "Costs and Benefits of Training and Experience," by Stanley A. Horowitz and Bruce N. Angier, in *Proceedings of the Symposium on the Military Value and Cost-Effectiveness of Training*, edited by Jesse Orlansky, published by NATO, January 1985.

<sup>10</sup> The study covered both electronic and mechanical equipment.

One well-known study of the determinants of military performance did not find experience to be a key element in performance. It found mental ability, as measured by scores on the Armed Forces Qualification Test (AFQT), to be far more important as a predictor of the performance of tank crews on firing ranges [12]. Since the work that has found experience to be very valuable has tended to focus on jobs involving equipment maintenance, this may indicate that a high level of experience is more important for maintenance-related work than for combat tasks.

On the other hand, a recent analysis of the performance of Army Reserve and National Guard units found significant relationships between the experience of key personnel and the performance of both combat and combat support units [13]. The methodology used in this research could easily be applied to the active Army.

There is additional evidence that experience is valuable not only in maintenance. On-going research has shown that pilot performance is closely related to career experience. This has been demonstrated for a fairly wide range of tasks and aircraft. Perhaps the most interesting result of this research is the finding that pilots with greater career experience are significantly more likely to survive in air-to-air combat and are more likely to shoot down their opponents [14].<sup>11</sup>

In addition to research based on the actual observed performance of military units, surveys have been structured to examine the relationship between experience and productivity. Two of these focused on the growth of productivity during the first term in a large number of occupations. Not surprisingly, such growth was found to be very rapid [7 and 15]. A later survey examined the performance of particular tasks in a single occupation over an entire career [16]. It estimated that the most senior enlisted personnel were over 50 percent more productive than personnel who were just entering their second terms.

Table 1 showed that the reserve components of the military tend to be more senior than the active components. In the Navy, the Selected Reserve reinforcing units associated with active ships and squadrons are an exception to this generalization. More than 10 percent of shipboard billets are assigned to reserve augmentees.<sup>12</sup> They are mostly junior personnel filling gaps that Navy resource sponsors chose not to staff with active-duty personnel. Usually their absence has no effect on reported readiness. The personnel

---

<sup>11</sup> This analysis examined the performance of F-14 aircrews in air combat maneuvering exercises performed on instrumented ranges.

<sup>12</sup> In 1987, 28 percent of Navy Selected Reservists, about 40,000 individuals, were assigned to reinforcing units. See Reference [17].

readiness reported by active units to SORTS (Status of Readiness and Training System) has been consistently high in the absence of the augmentees.<sup>13</sup> Reserve augmentation units were not called to participate in Operation Desert Storm, providing additional evidence that they do not make an important contribution to readiness.

One qualification should be made to the conclusion that experience makes military personnel more productive. Some of the relationship between experience and performance may be related to the tendency of the services to promote the most productive personnel, and to the possible tendency of the best performers to be satisfied and want to remain in the military. In other words, experienced personnel may be experienced because they are good, not good because they are experienced. There is, however, a mechanism that works in the other direction. Good performers probably can have more successful civilian careers. The more powerful pull of the civilian job market may well make them less likely to reenlist than others.

The relationship between experience and the intrinsic quality of personnel has policy implications. If good performers tend to stay in the military, additional experience bought with higher reenlistment bonuses will not yield the amount of extra productivity expected (because the additional reenlistees will not, on average, be as good as the original reenlistees). If, on the other hand, those who leave today are better than those who stay, efforts to enhance retention will yield even greater productivity gains than expected. Surveys that examine the time path of productivity of individual enlisted personnel strongly support the notion that personnel get better with experience, regardless of their intrinsic ability.<sup>14</sup> On-going research at the Center for Naval Analyses indicates that there is not much of a relationship between inherent ability and experience.

### C. THE PROPER EXPERIENCE MIX

Experienced personnel cost more, but in many circumstances they are more productive. How does this balance out, and how does the most cost-effective experience mix differ from the current mix? Existing examinations of this question are suggestive, but not conclusive.

---

<sup>13</sup> This point was made in a 1985 paper (see Reference [18]). It was confirmed as still being correct by personnel in OP-951.

<sup>14</sup> See, for example, References [7 and 15].

An analysis based on the aviation maintenance findings cited previously implies that by moving to a force much heavier in the most senior personnel, a Navy A-7 squadron could maintain squadron performance with 18 percent less manpower at a life-cycle cost savings (including training costs) of 12 percent. The costs of senior personnel were not appropriately adjusted, however, to include retirement costs.

An analysis based on RAND's first-term survey results recommended substantially reducing personnel accession and increasing retention with higher reenlistment bonuses. This analysis also failed to include retirement costs. In addition, it was unable to consider increases in experience beyond the end of the first term. Still, it found that first-term reenlistment bonuses are too low in virtually all occupations [6 and 19].

The Congressional Budget Office (CBO) conducted a study that examined trading higher experience for lower personnel strength levels. It was based largely on Craig Moore's survey analysis of career productivity growth [20]. CBO found that it might be possible to maintain performance with 30,000 fewer military personnel.<sup>15</sup> While the study focused on the substitution between the number of personnel and their experience, it did not attempt to estimate how far to carry the substitution.

The recent RAND work on the implications of proper retirement costing has shown how costs could be contained by limiting the growth in seniority, but it does not address the relative performance of junior and senior personnel or the implications of different performance levels for the required number of personnel [2].

## D. ADDITIONAL CONSIDERATIONS

### 1. Other Costs and Benefits

The indicators of cost and performance that have been focused on so far are not fully adequate for determining the appropriate mix of experience.

Cost has implicitly been defined as cost to the active military services, but changes in the experience mix may have important implications for the cost of running the reserve components. As the experience mix becomes richer, retention levels rise. With fewer personnel leaving the active service, the reserves may have to recruit more non-prior-

---

<sup>15</sup> An extrapolation was made to the entire military from research based on a single occupation, a very imprecise extrapolation.

service personnel. Their recruiting and training costs would rise, their experience mix would become less senior, and their level of performance might fall.

Wartime might call for a different mix of experience than peacetime. A peacetime policy of increasing experience and decreasing staffing levels might make it more difficult to replace combat losses. On the other hand, a more senior peacetime force might be better able to provide the cadres needed to expand in time of mobilization.

All the services have policies against leaving individuals in unattractive billets (e.g., overseas or at sea) for too long. Rotation billets in more attractive locations are needed to prevent unattractive tours from getting too long. In some cases, the need to provide rotation billets might argue against trading end-strength for experience. In unattractive locations, however, billets saved by substituting fewer experienced personnel for inexperienced ones may permit a further reduction in rotation billets. Also, the reduction of U.S. forces in Europe will decrease the need for rotation billets.

Final determination of the experience mix of personnel should rely on as broad a view of the relevant costs and benefits as possible. Difficulty in quantifying some of these indirect effects should not discourage us from studying the cost-effectiveness of alternative mixes at the unit level.

## 2. Implementation Issues

If a decision is made to move toward greater experience in some areas, there will be three principal impediments to rapid action: the mix of personnel in today's military, the need to develop new manning standards for a host of units, and the services' inability to pay the kind of bonuses needed to develop a more experienced force.

In the absence of a major move toward lateral entry, the experience mix can only change slowly. Even if a move to attain a more experienced force is made, many of today's first termers will still be relatively junior for some time to come. If change is decided upon, an opportunity is presented to take advantage of the reduction in force size that is taking place. Decisions on who to encourage to leave and who to keep should be based, at least in part, on the experience mix desired in the long term. If too many mid-career personnel are encouraged to leave now, efforts to increase the level of seniority will be hampered for some time to come. Still, care must be taken to avoid problems down the road. Cutting accessions way back now may cause a shortage of senior personnel in ten to fifteen years.

The personnel management system needs to know what it is shooting for. The planned revisions to the DoD directive and instruction on enlisted personnel management should emphasize the need to explicitly tie the services' management goals for experience to stable, long-term objectives that are clearly linked to the relative cost and performance of personnel with different experience levels. OSD should understand that to conform to this guidance, the services will have to develop new analytic tools. This will take a while.

A decision to increase the seniority of maintenance personnel will require a complete rewriting of the billet structure for such personnel in a host of units. Plans must be laid to assure that this gets done with a minimum of disruption. A close look at the methods currently used for determining skill requirements at the unit level is in order. Particular attention should be paid to identifying whether and how procedures should be changed to better consider differences in performance with respect to experience.

Congress must be on board if real change is to take place. Perhaps limitations on the numbers of E8s and E9s will have to be relaxed. A more senior force in some occupations would require reenlistment bonuses far in excess of anything paid today. A detailed proposal showing how authority for higher bonuses will save money will have to be prepared and sold to Congress.

## **V. SUMMARY AND RECOMMENDATIONS**

### **A. SUMMARY**

Over the last fifteen years, the services have substantially increased the experience level of enlisted personnel. This shift affected all the services, but was most pronounced in the Army, where the fraction of those with under four years of service fell from two-thirds to less than half. The rise in experience is the result of increased retention that accompanied the adoption of an all-volunteer military.

Increases in experience levels have not been accompanied by a reevaluation of the requirements for experience at the unit level. There has been no effort to reduce endstrength as a result of the increase in experience. Where endstrength has been reduced, it has been the result of force structure cuts. When experience levels are increased, policy makers should consider using the higher productivity of more experienced personnel as the basis for reducing the number of enlisted personnel. A key finding of this review is that, in at least some cases, it appears that significant savings can be made with no cost in performance by appropriately substituting experience for quantity.

The best mix of experience depends on the relative cost of people with different levels of experience and on their relative performance. More senior people have higher pay, allowance, and retirement costs, but lower training costs. They are more productive, but the extent of their additional productivity varies by occupation. There can be no presumption that the same mix of experience is appropriate in all occupations. There is surprisingly little variation in experience levels among occupational groups. It is possible that today's experience levels are too high in some occupations and too low in others.

### **B. RECOMMENDATIONS**

Not enough is known to support a complete overhaul in experience policy, but enough is known to justify an orderly approach to modifying policy. This approach should have four main thrusts: additional research on the relationship between experience and performance, more comprehensive analysis integrating the costs and benefits of greater experience, experiments to confirm the implications of earlier research, and actions to modify the experience mix in selected areas.

## **1. Research on Experience and Performance**

Existing evidence on the value of experience is spotty; however, a strong case can be made that not enough experience is "bought" in maintenance-oriented occupations. A weaker case can be made that the same is true in more operational billets. The paucity of research on the value of experience should be remedied through the following steps:

- Use the information being gathered at the National Training Center (NTC) to study the value of experienced personnel in ground combat. The Army Research Institute (ARI) has shown that data developed from NTC exercises can support analyses of the way in which experience, as well as other personnel-related factors, influence the performance of ground combat units [21].
- Sponsor surveys of the kind described in Craig Moore's work [16]. Information is needed about how performance improves with experience throughout career for all kinds of occupations. The right experience mix is probably very different in different occupations largely because of differences in the relationships between experience and performance.
- Examine constraints on trading numbers for experience. Even if senior personnel are much more productive in most tasks, there may be some tasks for which a critical mass of personnel is needed. A tank, for example, must have all its stations manned and a ship may have minimum requirements for damage-control personnel.

## **2. Integrating the Costs and Benefits of Experience**

There has never been an examination of the appropriate experience mix that had all of the following characteristics:

- proper treatment of costs, including retirement costs and training costs,
- consideration of the growth of productivity over the entire course of a career,
- separate analysis of different occupational groups,
- incorporation of constraints reflecting the minimum acceptable number of personnel in some occupations or circumstances.

Such an examination should be structured and performed.

## **3. Experimental Confirmation**

Experience policy for maintenance occupations is a candidate for change. Research strongly indicates that money could be saved and the job be done at least as well with fewer, more experienced individuals. Still, the research is all statistical, largely based on

variation among units in experience. Little (or none) of the research involved reducing the number of maintenance personnel. Before manning standards are changed, assurance is needed that smaller, more experienced units will be able to do the job. All three services should develop alternative manning experiments in the maintenance area. These experiments should serve as a final check on the desirability of changing experience policy for maintenance personnel.

#### 4. Actions to Modify the Experience Mix

Two possibilities for going beyond research and experimentation in the short term suggest themselves:

- Consideration should be given to eliminating Selected Reserve reinforcing units in the Navy. Ship and squadron manning documents should be reviewed with an eye toward eliminating billets usually assigned to augmentees.
- The management and manning philosophy that is applied to ships run by the Military Sealift Command should be extended as much as possible. As a first step, additional classes of auxiliary ships should be considered. MSC's outstanding record of achieving high operational readiness and low manning costs by using small, highly experienced crews seems to demonstrate that quality can be substituted for quantity.

Over the long term, a move toward greater experience will require a closer look at recruiting policy, billet structure, skill requirements, and bonuses before significant changes can be made.

## REFERENCES

- [1] Hall, Robert E. "The Importance of Lifetime Jobs in the U.S. Economy." *American Economic Review*, September 1982, pp. 716-724.
- [2] Grissmer, David W., James R. Hosek, and Richard L. Eisenman. "Reshaping the Enlisted Personnel Force Structure: Alternatives and Cost Savings." The RAND Corporation, presented at the Western Economic Association Meetings, June 1989.
- [3] Horowitz, Stanley A. "Experience and Readiness," in *Army Manpower Economics*, edited by Curtis L. Gilroy, Westview Press, 1986. (Much of the same material is in "Skill Mix, Experience and Readiness," by the same author, Center for Naval Analyses, Professional Paper 411, October 1983.)
- [4] General Accounting Office, *Enlisted Force Management: Past Practices and Future Challenges*, GAO/NSIAD-91-48, January 1991.
- [5] Angier, Bruce N., Kurt A. Driscoll, and Kathy A. Carpenter. "Construction of 'Training Cost Per Graduate' for the Navy Comprehensive Compensation and Supply Study." Center for Naval Analyses, Professional Paper 386, November 1982.
- [6] Clay-Mendez, Deborah, Ellen Balis, Kurt A. Driscoll, Bruce N. Angier, and Robert F. Lockman. "Balancing Accession and Retention." Center for Naval Analyses, CNS 1176, September 1982.
- [7] Weiher, Rodney, and Stanley A. Horowitz. "The Relative Costs of Formal and On-the-Job Training for Navy Enlisted Occupations." Center for Naval Analyses, Professional Paper 83, November 1971.
- [8] Goldberg, Lawrence. "Enlisted Supply: Past, Present and Future." Center for Naval Analyses, CNS 1168, September 1982.
- [9] Horowitz, Stanley A., and Allan Sherman. "Crew Characteristics and Ship Condition." Center for Naval Analyses, March 1977.
- [10] Marcus, A. J. "Personnel Substitution and Navy Aviation Readiness." Center for Naval Analyses, October 1982.
- [11] Quester, Aline, Russell Beland, and William Mulligan. "Ship Material Readiness." Center for Naval Analyses, March 1989.
- [12] Scribner, Barry L., D. Alton Smith, Robert H. Baldwin, Robert W. Phillips. "Are Smart Tankers Better Tankers: AFQT and Military Productivity." Department of Social Sciences, United States Military Academy, December 1984.
- [13] Frieder, Kenneth H., Rodney D. McConnell, and David A. Roe. "An Alternative Approach to Estimating Reserve Component Readiness." Keton, Inc., briefing presented at the ORSA/TIMS Joint National Meeting, October 1990.
- [14] Hammon, Colin P., and Stanley A. Horowitz, "Flying Hours and Aircrew Performance," Institute for Defense Analyses, Paper P-2379, March 1990.

- [15] Haggstrom, Gus W., Winston K. Chow, and Robert M. Gay. "Productivity Profiles of First-Term Enlisted Personnel." The RAND Corporation, N-2059-RC, February 1984.
- [16] Moore, S. Craig. "Demand and Supply Integration for Air Force Enlisted Work Force Planning: A Briefing." The RAND Corporation, N-1724-AF, August 1981.
- [17] Office of the Secretary of Defense. *Annual Report of the Reserve Forces Policy Board, Fiscal Year 1987*. February 1988.
- [18] Horowitz, Stanley A., Cdr. Mary Wuest, and Cdr. Gary Johnson. "The Readiness of the Naval Reserve." Center for Naval Analyses, Working Paper 85-0015.10, January 1985.
- [19] Balis, Ellen. "Balancing Accession and Retention: Cost and Productivity Tradeoffs." Center for Naval Analyses, Professional Paper 380, March 1983.
- [20] Fernandez, Richard L. *Setting Personnel Strength Levels: Experience and Productivity in the Military*. Congressional Budget Office, September 1987.
- [21] McFann, Howard H. *Relationship of Resource Utilization and Expenditures to Unit Performance*. Presented to the NATO Defense Research Group (Panel VII) RSG-15 Workshop on the Military Value and Cost-Effectiveness of Training, October 1990.

## ABBREVIATIONS

AFQT	Armed Forces Qualification Test
ARI	Army Research Institute
CBO	Congressional Budget Office
DoD	Department of Defense
GAO	Government Accounting Office
IDA	Institute for Defense Analyses
LOS	length of service
MSC	Military Sealift Command
NTC	National Training Center
OASD (FM&P)	Office of the Assistant Secretary of Defense (Force Management and Personnel)
OJT	on-the-job training
OSD	Office of the Secretary of Defense
POF	Program Objective Force
SORTS	Status of Readiness and Training System